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Experimentation: Creating an Active, Collaborating Community of Practice (COP)

**75th Military Operations Research Society Symposium (MORSS)
WG 33 Warfighting Experimentation**

Kirk Michealson, Experimentation COP Chair

- **Results of the Experimentation Workshop**
 - Workshop Chair Brief to the MORS Sponsors
- **Experimentation Community of Practice**
 - Background
 - Organization
 - Next Steps
- **Potential WG 33 Name Change**

Experimentation Workshop

Bringing Analytical Rigor to Joint Warfighting Experimentation:

Design, Planning, Execution, Analysis and Reporting

**Military Operations Research
Society (MORS) Workshop**

Sponsor Brief

Kirk Michealson, Workshop Chair

- **Special Meeting Background**
- **Key Changes & Enduring Challenges**
- **Overall Summary**
 - Overarching Objectives
 - JFCOM / J-9 Analytical Challenges
 - Working Group Discussions
- **Status & Final Thoughts**

EXPERIMENTATION WORKSHOP

Background: Workshop Overview



Bringing Analytical Rigor to Joint Warfighting Experimentation

- **WHEN:** Monday-Thursday, 2-5 October 2006
- **WHERE:** Joint Forces Staff College, Norfolk, VA
- **FORMAT:**
 - Tutorial, Monday, 2 October 2006
 - Mini-Symposium, Tuesday, 3 October 2006
 - Workshop, Wednesday-Thursday, 4-5 October 2006
- **ATTENDANCE**
 - Special meeting: 113 – 61 members and 52 non-members
 - 5 foreign: Canada, Australia and Germany
 - Tutorial: ~ 40

EXPERIMENTATION WORKSHOP

Background: Workshop Purpose and Goal



- **Workshop Purpose:**

- Provide a forum for discussing approaches to warfighting experimentation
- Provide an opportunity for military and civilian operations research analysts to examine topics, methodologies, analyses, and innovations pertinent to all aspects of designing, executing, analyzing, and reporting joint warfighting experiments.

- **Workshop Goal:**

- The goal of the 1999 *Joint Experimentation Workshop* was to develop an experimentation process
- Using the results of the 1999 Workshop and the two published Codes of Best Practice for Experimentation, the goal of this workshop is to determine how to apply analytical rigor across the process.

EXPERIMENTATION WORKSHOP

Background: Leadership



- **Workshop Chairs**

- Kirk Michealson, Lockheed Martin Center for Innovation
- Dr. Mike Cochrane, JFCOM / J-9

- **Technical Chair**

- Dr. Richard Hayes, EBR, Inc.

- **Bulldog**

- Dr. Lee Lehmkuhl, MITRE Corp.

- **Synthesis Group Chair**

- Roy Reiss, FS, HQ AF/A9

EXPERIMENTATION WORKSHOP

Overview: Working Groups



- **WG 1: Experiment Design**
 - Co-Chairs: Steve Boothe, COMOPTEVFOR & Dennis DeRiggi, IDA
- **WG 2: Data Collection, Metrics Evaluation & Reporting**
 - Chair: Rick Rigazio, NWDC
- **WG 3: Methodologies and Tools**
 - Chair: Scott Hamilton, ACC AFC2ISRC/AFEO (L-3 Comm)
- **WG 4: People as Experimental Assets**
 - Chair: Alex Hoover, JFCOM/JKDDC (Sparta, Inc.)
- **WG 5: Integration & Coordination Across DoD**
 - Chair: Mike McGinnis, VMASC
- **WG 6: Analytical Rigor to Support Capabilities Based Planning**
 - Chair: Teresa Wilson, Lockheed Martin Aerospace

EXPERIMENTATION WORKSHOP

Overview: Mini-Symposium



- **Keynote Presentation**

- Mr. Dave Ozolek, Deputy JFCOM / J-9

- **Joint Presentations**

- Col Eileen Bjorkman, Director, Joint Test and Evaluation Project
- Mr. Richard Marchant, Director, Joint Experimentation Project, Office of the Assistant Deputy Secretary of Defense for Joint & Coalition Operations Support
- Mr. Mel Chaloupka, Head of Experimentation and Transformation at USPACOM
- LTC Bryan Luke, Chief Joint Experimentation, Transformation, and Concepts Division, Joint Staff / J-7

- **Service and Coalition Presentations**

- Col Mike Wilmer, Studies and Analysis Chief, Army Capabilities Integration Center
- CDR Steve Swittel, Experiment Coordinator, Naval Warfare Development Command
- Col Larry King, Director, Joint Concept Development and Experimentation, MCCDC
- Mr. Michael Knollman, Assistant Deputy Under Secretary of Defense for Joint and Coalition Operations
- Mr. Michael Wahl, Chief Analyst, Multi-National Experiments
- Capt Kathy Shield, Operational Experimentation Branch Head, Allied Command Transformation

EXPERIMENTATION WORKSHOP

Background: Workshop Overarching Objectives



- **Overarching issues:**

- What is analytical rigor? What is the level?
- Can the techniques discussed from the 1999 MORS Workshop on *Joint Experimentation* be used? (specifically M-E-M)
- Should the DoD Command and Control Research Program's (CCRPs) *Codes of Best Practices* be adopted as an analytical best practice?
 - With the UK and US leading the way, the “NATO Code of Best Practice for C2 Assessment” has been formally adopted by several governments and is having a positive effect on the quality of work within the alliance.
- What is the extent of collaboration in experimentation?
 - Among the Services? Within the Coalition Forces? With the U.S. Agencies?

EXPERIMENTATION WORKSHOP

Changes: 1999 to 2006



- **1999 Workshop on *Joint Experimentation***
 - To develop an experimentation process
- **Key Changes: 1999 to 2006**
 - Focus shift from concepts to capabilities
 - Now at war:
 - Nature of warfare from MCO to GWOT
 - Focus changed from mid-term to near-term emphasis
 - Difficulty bringing a team together for large events
 - Better tools for Model – Experiment – Model
 - DODCCRP's *Code of Best Practices for Experimentation*
- **2006 Workshop on *Bringing Analytical Rigor to Joint Warfighting Experimentation***
 - To determine how to apply analytical rigor across the process

EXPERIMENTATION WORKSHOP

Changes: Enduring Challenges



- **Enduring challenges**
 - Lack of common lexicon
 - Planning experimentation campaigns vice single experiments
 - Joint collaboration – international, inter-agency, NGO/PVO
 - Tools and methods to support efficient & effective experiments
 - Educating & training all participants
 - Building multi-disciplinary teams

EXPERIMENTATION WORKSHOP

Overview: Definition



- **Analytical Rigor in Experimentation –**

- *TOR:*

- *The application of precise and exacting standards in the examination of a question carried out under controlled conditions to better understand and draw conclusions in order to discover an unknown effect, to test a hypothesis, or demonstrate a known fact, and ~~usually~~ based on careful consideration or investigation.*

- *WG Additions:*

- *WG 2: “adherence to a logical process of addressing issues through metrics and measures is critical to achieving rigor”*
 - *WG 6: “execution of a well-defined study plan with appropriate parameter space that has subjective and empirical results; traceable to data that supports a joint warfighter need.”*

EXPERIMENTATION WORKSHOP

Summary: Overarching Objectives Review



- **Overarching issues:**

- What is analytical rigor? What is the level?
- Can the techniques discussed from the 1999 MORS Workshop on *Joint Experimentation* be used? (specifically M-E-M)
- Should the DoD Command and Control Research Program's (CCRPs) *Codes of Best Practices* be adopted as an analytical best practice?
 - With the UK and US leading the way, the “NATO Code of Best Practice for C2 Assessment” has been formally adopted by several governments and is having a positive effect on the quality of work within the alliance.
- What is the extent of collaboration in experimentation?
 - Among the Services? Within the Coalition Forces? With the U.S. Agencies?

EXPERIMENTATION WORKSHOP

Summary: Overall



- **Providing Analytical Rigor**
 - Two key elements: applying the Scientific Method & providing traceability from design to data to results
- **Using the Model-Experiment-Model Paradigm**
 - With limited time and resources, can be used to enhance analytical rigor
- **Adopting DODCCRP's *Codes of Best Practice for Experimentation***
 - Are an important first step, provided a good set of guidelines, and were a good foundation for experimentation
- **Allowing More Consistent Collaboration**
 - A culture change is necessary to foster sharing, create DoD-wide enforcement or incentives, develop standard terminology, and reuse / leverage findings across the Services, Multi-National Forces, Agencies and Non-Government Organizations

The key is getting the analyst involved early and throughout the process.

EXPERIMENTATION WORKSHOP

Summary: Why Analytical Rigor?



- **Why have analytic rigor?**
 - More confidence that the insights gained are not misleading decision makers
- **Current State –**
 - Overall – Recognized but Inconsistent
- **Key elements for analytical rigor:**
 - Use the scientific method and proven Operations Analysis approaches throughout the experiment
 - Start with well defined study plan with appropriate parameter space that has subjective and empirical results; traceable to data
 - One of the items that many of the working groups highlighted was the need for more peer review.
 - The synthesis group discussed including this as a key element, but decided that this was an integral part of the application of the scientific method and good operations analysis practice and decided not to include it as a separate element.

EXPERIMENTATION WORKSHOP

Summary: *COBP* as a Best Practice



- **What is a “Best Practice?”**
 - “Best practices” that have been found useful in a number of countries.
 - They have been widely used as educational tools, guidelines, stimuli to ensure quality and, in some cases, roadmaps.
 - They are not rigid rules and they include reasons for each of the practices that are suggested.
- **Previous Experience**
 - With the UK and US leading the way, the “NATO Code of Best Practice for C2 Assessment” has been formally adopted by several governments and is having a positive effect on the quality of work within the alliance.
- **Recommendation to MORS Sponsors**
 - Adopt DODCCRP’s *Codes of Best Practice for Experimentation* as a MORS best practice
- **Decision from First Sponsor’s Brief**
 - Can list on MORS web-site as recommended reading

EXPERIMENTATION WORKSHOP

Summary: Model-Experiment Model (M-E-M)



- **1999 Workshop**

- Recommended to structure insights and provide a high return on investment in the concept exploration phase.

- **Discussion**

- With limited time and resources, a model could be used to shape the experiment.
- During the experiment, human-in-the-loop information could be collected.
- This information could be modeled for further analysis after the experiment

- **Final Thoughts**

- M-E-M could be used to structure the experiment and to conduct follow-on analyses.

EXPERIMENTATION WORKSHOP

Summary: State of Collaboration # 1



- **MORS Current Practice**

- Annual Symposium to share work
- Special Meetings to focus on priority topics
- Very little follow-on for topics and meetings
 - Some exceptions: CBP and Experimentation Special Meetings

- **MORS Leadership Guidance**

- MORS President Theme:
 - Growing (experimentation) Analysts, Expanding Toolsets (what's out there for experimentation), and Improving Analysis
- MORS President-Elect Platform:
 - “Launching Change for the Future” (there's always room for improvement)
- MORS VP (Meeting Ops) Advice:
 - We need to follow-up on Special Meetings, reporting back to the MORS Sponsors

EXPERIMENTATION WORKSHOP

Summary: State of Collaboration # 2



- **Workshop Recommendation**

- Create an active, collaborating community of practice of Experimentation
- Use WG 33, *Warfighting Experimentation*, as an active peer group

- **Next Steps**

- Experimentation Workshop Chair is working with WG 33 Leadership to hold first session of MORS Experimentation Community of Practice
- WG Session at 75th MORSS
 - Provide overview of MORS Experimentation Workshop
 - Query attendees on what's been done since the workshop
 - Establish the Experimentation Community of practice structure
 - I.e., organization, charter, meeting periodicity, sub-groups
 - Advertise session (e.g., Experimentation Workshop and WG 33 database)
- After the 75th MORSS, report to MORS Leadership and Sponsors on what's been done and the next steps

EXPERIMENTATION WORKSHOP

Summary: JFCOM / J-9 Analytical Challenges



- **New methodologies for capabilities-based experimentation. How do we use experimentation to evaluate the ability of potential solutions to meet functional capability gaps?**
- **Integration of analysis and “meta-analysis”.**
 - How can we “feed forward” knowledge and insights from one event to the next?
 - How do we synthesize significant emerging results across disparate lines of experimentation?
 - How can we build the body of knowledge through historical and thematic analysis of experimentation?
- **More comprehensive and rigorous review of literature. How can we develop tools, techniques and standards to more effectively review the state of practice and the academic literature and provide valid baselines for the advancement of knowledge?**
- **Integration of established qualitative analytical methodologies.**
 - How can we incorporate tested methodologies such as content- or factor-analysis to analyze data that consists largely of text?
 - Can such approaches be considered as “rigorous” as traditional OR techniques?

EXPERIMENTATION WORKSHOP

Summary: Recommendations for J-9 Challenges



- **Experimentation in Capabilities Based Assessments**
 - Use existing qualitative analytical methods to prioritize / filter proposed solutions
 - Use Model-Experiment-Model to investigate only top candidates
- **Knowledge Building**
 - Must plan and resource literature review, documentation, archiving
 - Require in deliverable, integrate into schedule
 - Emphasize long-term savings: time and \$\$ (e.g. reuse of data)
 - Lead by example: JFCOM J9 adopt internally
 - Expand to services: conduit -> JFCOM J9 co-chair MORS Symposium Experimentation Working Group-33
- **Qualitative Analytical Methodologies**
 - Considered rigorous if used appropriately
 - Plan for traceability throughout the experiment
 - Multiple replications for statistical rigor not typically available in experiments

EXPERIMENTATION WORKSHOP

Summary: Working Group Discussions # 1



- **WG 1: Experiment Design**

- Issues (from their perspective)

- Absence of peer reviews
 - Lack of a knowledge base

- Recommendations

- Create an active advisory group
 - Improve experimentation-related definitions & terminology
 - Need to demonstrate the value and relevance of Design of Experiments methodology in terms of risk reduction, profitability and efficiency

- **WG 2: Data Collection, Metrics Evaluation & Reporting**

- Findings

- The Analysis Plan is the key document; it is a contract. If not followed, results may not be guaranteed

- DO NOTs

- Do not development measurements irrelevant to study objectives
 - Do not get involved too late
 - Do not simply report statistics without showing operational impact

EXPERIMENTATION WORKSHOP

Summary: Working Group Discussions # 2



- **WG 3: Methodologies and Tools**

- Shortfalls (from their perspective)

- Lack of standards
 - Lack of a knowledge base

- Recommendations

- Develop experimentation-related training
 - Develop a reference guide for methodologies and tools across the experimentation life cycle

- **WG 4: People as Experimental Assets**

- Issues (from their perspective)

- Inappropriately using Subject Matter Experts (SMEs)
 - Lack of relevant expertise in human behavior analyses
 - Lack of a knowledge base

- Findings

- During the planning phase, need to design what is needed from SMEs
 - Bias from SMEs must be considered and managed through all phases

EXPERIMENTATION WORKSHOP

Summary: Working Group Discussions # 3



- **WG 5: Integration & Coordination Across DoD**

- Issues (from their perspective)
 - Lack of shared vision on Joint Experimentation, “coalition of the willing”
 - Cultural mindset is needed
- Recommendations
 - Encourage information sharing
 - Create a knowledge base
 - Conduct formal peer reviews

- **WG 6: Analytical Rigor to Support Capabilities Based Planning**

- Issues (from their perspective)
 - Lack of common definitions and terminology
 - Lack of standards
 - Lack of collaboration and access to other’s data
- Recommendations
 - Create an experimentation lexicon
 - Provide experimentation training
 - Develop a knowledge base

EXPERIMENTATION WORKSHOP

Status: Documents



• Status

– PHALANX Article

- In December 2006 issue

– Final Report

- Review completed by planning committee (Draft and Revision 1)
- Submitted to MORS Communication Manager and Publications Committee on 12/14
- Being reviewed by the MORS Sponsors and MORS Office

EXPERIMENTATION WORKSHOP

Summary: Final Thoughts



• Workshop Results / Next Steps

– Analytical Rigor:

- Current Level: Inconsistent Use → Recommend following a logical process with traceability

– M-E-M:

- Same as 1999 → Propose use to help shape experiments and conduct follow-on analyses

– Best Practice

- List DODCCRP's *Codes of Best Practice for Experimentation* as recommended reading on the new MORS Experimentation Community of Practice web pages

– State of Collaboration:

- Current Level: Infrequent to Inconsistent Use
- Next Steps → Establish an active, collaborating Community of Practice for Experimentation

– JFCOM/J-9 Challenges:

- Quick response by attendees to Workshop Proponent

EXPERIMENTATION WORKSHOP

Summary: Remaining Issues



- **Remaining Issues for Experimentation COP to Consider**
 - Developing a common lexicon for experimentation definitions and terminology.
 - Drafting a proposed peer review process.
 - Creating a list (with descriptions) of the available experimentation methodologies and tools.
 - Developing experimentation training materials.
 - Investigating the requirements and how to collaborate via a web-based approach.
 - Ensuring better linkages to T&E, Exercises, JCIDs / JCAs.
 - Developing a 20-30 page “How To” guide (Sponsor Recommendation).
 - Providing information on how to do better human-in-the-loop experimentation.
 - Establishing experimentation standards.
 - Developing a list of common experimentation metrics

Experimentation Community of Practice (COP)

Experimentation COP

Background: Workshop Collaboration Review # 1



- **MORS Current Practice**

- Annual Symposium to share work
- Special Meetings to focus on priority topics
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- **MORS Leadership Guidance**

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- MORS VP (Meeting Ops) Advice:
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Experimentation COP

Background: Workshop Collaboration Review # 2



- **Experimentation Workshop Recommendation**

- Create an active, collaborating community of practice of Experimentation
- Use WG 33, *Warfighting Experimentation*, as an active peer group

- **Next Steps**

- Experimentation Workshop Chairs and WG 33 Leadership held first session of MORS Experimentation Community of Practice
- WG Session at 75th MORSS → **THIS SESSION**
 - Provide overview of MORS Experimentation Workshop
 - Query attendees on what's been done since the workshop
 - Establish the Experimentation Community of practice structure
 - I.e., organization, charter, meeting periodicity, sub-groups
- After the 75th MORSS, report to MORS Leadership and Sponsors on what's been done and the next steps

Experimentation COP

Organization: Setting up a COP



- **What do you need to do to establish a Community of Practice?**

- √ Recommend a Community of Practice area (Experimentation)
- √ Develop a draft charter (developed)
- √ Create an organization (have leadership)
- √ List some potential issues to work on (have list)

Experimentation COP

Organization: Charter and Meetings



- **Experimentation COP Charter (handout with details)**

- Forum for communication and collaborating within MORS
- Foundation from 2 MORS Experimentation Workshops
- Interface with experimentation-related analysis activities
- Methodology developed to share experimentation-related info
- Experimentation-related activities identified and summarized

- **Experimentation COP Meetings**

- Annually, as part of WG 33, *Warfighting Experimentation*
- Regularly throughout the year via MORS telecon
 - Full COP: Plan is to meet quarterly as a COP
 - Each Sub-Group: TBD, perhaps monthly or twice a quarter

Experimentation COP

Organization: Experimentation COP



- **Experimentation organization**

- Initial Leadership (Experimentation Workshop & WG 33 Leadership)

- Chair: Kirk Michealson, Experimentation Workshop Chair
 - Co-Chairs:
 - Brad Baylor, Experimentation Workshop Attendee & WG 33 Member
 - Chris Herstrom, Experimentation Workshop Synthesis Group & WG 33 Chair
 - Dr. Mike McGinnis, Experimentation Workshop WG Chair & WG 33 Co-Chair
 - Kemp Littlefield, Experimentation Workshop Attendee & WG 33 Advisor

- COP Membership

- Analysts volunteering would have to work on their own time or have their organizations support it
 - Why should analysts work in this new Experimentation COP?
 - Build up their experimentation network
 - Kept informed on experimentation issues throughout the community (could be common)
 - Potential professional growth opportunities within the experimentation community

Experimentation COP

Organization: Goals



- **Experimentation COP Goals**
 - The goal is not to tackle all possible tasks,
 - But to prioritize the experimentation analytical issues, and
 - To select a few where the Experimentation COP can make an immediate difference.
- **A Sub-Group is planned to be formed for each issue being worked**

Experimentation COP

Next Steps: Remaining Workshop Issues



- **Issues under consideration (not in priority order)**
 - Developing a process to nominate an experimentation analytical issue.
 - Developing a common lexicon for experimentation definitions and terminology.
 - Investigating the requirements and how to collaborate via a web-based approach.
 - Drafting a proposed peer review process.
 - Developing an Experimentation COP directory with names and contact information for members, as well as key experimentation personnel and organizations.
 - Ensuring there are instructions on the Experimentation COP web pages on the MORS web-site on how to get to the JFCOM / J9E Joint Experimentation Knowledge Portal.
 - Creating a list (with descriptions) of the available experimentation methodologies and tools.
 - Developing experimentation training materials.
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 - Developing a 20-30 page “How To” guide (Sponsor Recommendation).
 - Providing information on how to do better human-in-the-loop experimentation.
 - Establishing experimentation standards.
 - Developing a list of common experimentation metrics.

Which are the right ones to initially work?

Experimentation COP

Next Steps: Upcoming MORS Events



- ***Analysis Support for Wargaming Special Meeting***

- 16-18 October 2007
- Heritage Conference Center, NG-TASC, Chantilly, VA
- Ted Smyth, FS, Chair
- Planning Session, 0700 Thursday, June 14th, Chauvenet 103

- **Potential Special Meeting**

- Joint with ITEA, potentially in March
- Joint Test and Evaluation with constructive analyses
- Location: TBD (? NM ?)

Experimentation COP

Next Steps: Plans



- **Next Full COP Meeting**
 - MORS Telecon in September
- **By Next Meeting**
 - Form Sub-Groups
 - Hold Kick-Off Meetings for Each Sub-Group
 - Develop initial, draft plan of action & milestones for each Sub-Group

Experimentation COP

Next Steps: Areas and Volunteers



- **Any volunteers?**
 - Experimentation COP Committee Member
 - Experimentation COP Sub-Group Lead
 - Experimentation COP Sub-Group Member

Experimentation COP

Next Steps: Remaining Workshop Issues



- **Issues under consideration (not in priority order)**
 - *Developing a process to nominate an experimentation analytical issue.*
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 - Developing a list of common experimentation metrics.

Which are the right ones to initially work?

WG 33 Name Change

Experimentation COP

WG 33: Potential Name Change



- **We are doing a lot more than *Warfighting***

Experimentation

- Global War of Terror
 - Conflict resolution, stability operations
 - Emergency response and emergency management
 - Current Operations – order, security and stability
 - Integrating US Forces with host nations
- **What's the *right* working group name?**
 - Any suggestions?

BACK-UPS

EXPERIMENTATION WORKSHOP

Status: Recommendations



- **Recommendations**

- From the Workshop:

- Adopt DODCCRP's *Codes of Best Practice for Experimentation* as a MORS best practice
 - Use WG 33, Warfighting Experimentation, as an active community of practice and advisory group
 - Create a community-wide database for experimentation (JFCOM / J-9 may be a logical choice)

- Future Tutorials:

- How to conduct a literature search
 - Mid-level tutorial on Design of Experiments

- Future Special Meetings:

- Experimentation Workshop every 2 years
 - Limited Objective & ACTD Experimentation
 - Discovery & Human-in-the-Loop Experiments
 - Training to provide analytical rigor in Joint Warfighting Experimentation
 - Application of experimentation results